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Five new species of *Agriotypus* Curtis, 1832 (Hymenoptera, Ichneumonidae, Agriotypinae) from China

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Abstract

Five new species of *Agriotypus* Curtis, 1894 from China, are described and illustrated, *A. dui* **sp. nov.**, *A. maae* **sp. nov.**, *A. morsei* **sp. nov.**, *A. taishunensis* **sp. nov.** and *A. yangae* **sp. nov.** A key to all Chinese species of *Agriotypus* is provided.

Keywords

Agriotypus, Agriotypinae, China, key, new species, taxonomy

Introduction

Agriotypus Curtis, 1894, is the monotypic genus in the subfamily Agriotypinae so far (Hymenoptera, Ichneumonidae), comprising 16 species from the Palaearctic and Oriental Regions (Yu et al. 2016). Species of this genus are solitary idiobiont

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ectoparasitoids of trichopteran pupae and prepupae in fast-running water (Aoyagi and Ishii 1991; Bennett 2001). This genus can be easily identified by the following characteristics: fully sclerotised metasomal sternites; the second and third metasomal tergites (and sternites) fused, forming a syntergite (and synsternite); a distinct spine on the scutellum.

Chao (1992) proposed *Atopotypus* Chao as a new monotypic Agriotypinae genus. Bennett (2001) revised the world species of this subfamily and carried out a morphological phylogeny to explore the the subfamily relationships of basal Ichneumonidae and synonomized *Atopotypus* with *Agriotypus*. He also suggested two species groups, the Palaearctic *armatus* species group and the Oriental *himalensis* species group.

Nine species of *Agriotypus* have previously been known from China (Table 1) (Chao and Zhang 1981; Chao and Zhao 1986; He and Chen 1991; Chao 1992; He et al. 1997). During our study of Chinese Agriotypinae, we discovered other five new species of *Agriotypus*, *A. dui* sp. nov., *A. maae* sp. nov., *A. morsei* sp. nov., *A. taishunensis* sp. nov. and *A. yangae* sp. nov. In this paper all new species are described and illustrated and a key to the Chinese species of *Agriotypus* is provided.

Table 1. List of the Chinese species of the subfamily Agriotypinae before this study with distribution in China.

Species	Distribution
*Agriotypus changbaisha*nus Chao, 1981	Jilin, Liaoning
Agriotypus jilinensis Chao, 1981	Jilin
Agriotypus lui Chao, 1986	Fujian
Agriotypus maculiceps Chao, 1992	Guizhou
Agriotypus succinctus (Chao), 1992	Liaoning
Agriotypus tangi Chao, 1992	Fujian
Agriotypus townesi Chiu, 1986	Taiwan
Agriotypus zhejiangensis He *et* Chen, 1997	Zhejiang
Agriotypus zhengi He *et* Chen, 1991	Hubei

Materials and methods

This study is based on the specimens preserved in the Parasitic Hymenoptera Collection of Institute of Insect Sciences, Zhejiang University (**ZJUH**), Taiwan Agricultural Research Institute (**TARI**).

The terminology and measurements used follow Borad et al. (2018). The measurements of the scutellum length included the spine length. Abbreviations used in this study are as follows: **POL** = postocellar line, **OD** = ocellar diameter, **OOL** = oculo-ocellar line, **T1** = first metasomal tergite, **T2** = second metasomal tergite. All descriptions and measurements were made under a Zeiss Stemi 2000-C microscope (Germany); figures were made by a Keyence VHX-2000 digital microscope (Japan). Type specimens are deposited in the Parasitic Hymenoptera Collection of the Zhejiang University, Hangzhou, China (ZJUH).

Key to Chinese species of the genus *Agriotypus* Curtis

Females of *A. jilinensis*, *A. morsei* sp. nov., *A. succinctus*, *A. townesi*, *A. zhejiangensis* and males of *A. maae* sp. nov., *A. taishunensis* sp. nov., *A. yangae* sp. nov., *A. zhengi* are unknown.

1 Male **2**

– Female **10**

2 T2 with dorsal and dorsolateral longitudinal carinae basally; epomia dorsally curved sigmoidally or angulate; digitus stout, length no more than 5 × width at middle except in *A. maculiceps* (*himalensis* species group) **3**

– T2 without dorsal and dorsolateral longitudinal carinae basally; epomia dorsally straight, curving posteriorly, short or absent; digitus elongate, length more than 7.5 × width at middle, except in *A. jilinensis* (*armatus* species group) **8**

3 Length of T1 at least 7.0 × its apical width; lateromedian carinae of T1 incomplete posterior to 0.7; frons with a strong median longitudinal carina; paraemere in lateral view obliquely truncate apically. China (Fujian) ..... ***A. lui* Chao**

– Length of T1 less than 6.6 × its apical width; lateromedian and dorsolateral carinae of T1 complete; frons without median longitudinal carina; paraemere in lateral view squarely truncate or rounded apically **4**

4 T2 almost evenly coarsely rugoso-striate; spine of scutellum rounded apically (spine of scutellum straight, produced 80° dorsoposteriorly and complete straight); China (Taiwan) ..... ***A. townesi* Chiu**

– T2 without such sculptures; spine of scutellum tapered apically **5**

5 Paramere strongly convergent in lateral view; spine of scutellum completely straight. China (Guizhou) ..... ***A. maculiceps* Chao**

– Paramere parallel or divergent in lateral view; spine of scutellum upcurved basally or downcurved apically or both **6**

6 Mesopleuron impunctate medially dorsal to mesopleural sulcus; body reddish brown. China (Fujian) ..... ***A. tangi* Chao**

– Mesopleuron rugose medially dorsal to mesopleural sulcus; body black 7

7 Length of T1 6.5 × its apical width; scutellum more or less parallel in basal 0.25; spine of scutellum produced 50° dorsoposteriorly; paramere 1.2 × its apical width. China (Shaanxi) ..... ***A. dui* sp. nov.**

– Length of T1 4.8 × its apical width; scutellum tapering from base to tip; spine of scutellum produced 80° dorsoposteriorly; paramere 3.0 × its apical width. China (Shaanxi) ..... ***A. morsei* sp. nov.**

8 Lateromedian longitudinal carinae of propodeum incomplete; T1 without lateromedian carinae; epomia absent; epicnemial carina short, not bisecting mesopleural sulcus. China (Liaoning) ..... ***A. succinctus* (Chao)**

– Lateromedian longitudinal carinae of propodeum complete; T1 with lateromedian carinae at least basally; epomia present; epicnemial carina long, bisecting mesopleural sulcus **9**

9 Face with a strong longitudinal medial carina; medial longitudinal carinae of propodeum roughly parallel; spine of scutellum complete black. China (Jilin) ..... ***A. jilinensis* Chao**

– Face without longitudinal medial carina; medial longitudinal carinae of propodeum convergent apically; spine of scutellum pale apically. China (Jilin, Liaoning) ..... ***A. changbaishanus* Chao**

10 T2 without dorsal and dorsolateral longitudinal carinae basally; epomia short (*armatus* species group). (Pronotum sparsely punctation; clypeus with summit of convexity strongly angulate in lateral view; mesopleuron densely punctate. Body length 7.5 mm). China (Jilin, Liaoning) ..... ***A. changbaishanus* Chao**

– T2 with dorsal and dorsolateral longitudinal carinae basally; epomia long, dorsally curved sigmoidally or angulate (*himalensis* species group) **11**

11 Mesoscutum with pale spots posteriorly; mesoscutum mostly glabrous **12**

– Mesoscutum completely black or dark brown posteriorly, without pale spots; mesoscutum mostly pubescent **13**

12 Frons without a longitudinal carina; scutellum pale in apial half; spine of scutellum produced 35–45° dorsoposteriorly. China (Guizhou) ..... ***A. maculiceps* Chao**

– Frons with a longitudinal carina; scutellum completely black; spine of scutellum produced 85° dorsoposteriorly. China (Shaanxi) ..... ***A. maae* sp. nov.**

13 Spine of scutellum completely straight; forewing without any trace of darker longitudinal bands. China (Zhejiang) ..... ***A. zhejiangensis* He & Chen Note: He et al. 1997 misspelt female as male in the orginal description of *A. zhejiangensis*. This species is actually a female.**

– Spine of scutellum more or less upcurved; forewing with darker longitudinal bands **14**

14 Spine of scutellum thicker, produced posteriorly. (frons with a distinct longitudinal carina). China (Fujian) ..... ***A. lui* Chao**

– Spine of scutellum slender, produced dorsal posteriorly **15**

15 Scutellum funnel-shaped; length of scutellum 1.8 × its basal width; spine of scutellum short, rounded apically. China (Shaanxi) ..... ***A. yangae* sp. nov.**

– Scutellum long triangle-shaped; length of scutellum more than 2.0 × its basal width; spine of scutellum long, tapered apically **16**

16 Length of T1 5.1–5.5 × apical width; Body reddish brown **17**

– Length of T1 4.1–4.2 × apical width; Body almost black **18**

17 Posterior half of lateral lobe of mesoscutum glabrous, with only a few scattered punctures; lateral of pronotum with coarse and dense punctation; spine of scutellum shorter than length of propodeum; distance between dorsal tentorial pits 2.0 × the length between a tentorial pit and eye. China (Fujian) ... ***A. tangi* Chao**

– Mesoscutum densely punctulate and pubescence; lateral of pronotum with fine striation in upper half, lower half with two carinae; spine of scutellum

longer than length of propodeum; distance between dorsal tentorial pits 3.8 × the length between a tentorial pit and eye. China (Zhejiang) .... ***A. taishunensis* sp. nov.**

18 Length of scutellum 3.2 × its basal width; scutellum with longitudinal carinae basally; spine of scutellum produced 15° dorsoposteriorly. China (Hubei) .... ***A. zhengi* He & Chen**

– Length of scutellum 2.5 × its basal width; scutellum punctuation-rugosity basally, without longitudinal carinae; spine of scutellum produced 50° dorsoposteriorly. China (Shaanxi) ..... ***A. dui* sp. nov.**

***Agriotypus dui* sp. nov.**

http://zoobank.org/856461AC-1082-4CBB-9E32-749E09A70056

Figs 1, 2

Material examined. ***Holotype.*** ♀, China, Shaanxi prov., Qinling, Jialingjiang, 34.2°N, 106.8°E, 2000 m, 1998.VI.8, Du Yuzhou, No. 983341 (ZJUH). ***Paratypes*:** China: 30♀♀4♂♂, same data with holotype, Nos. 983342–983375 (ZJUH, 2♀♀ No. 983368–983369 kept in TARI); 2♀♀4♂♂, same location and time data with holotype, Ma Yun, Nos. 982946–982947 (ZJUH); 4♀♀, Shaanxi prov., Qinling, Tiantaishan, 1998.VI.9, Sun Changhai, Nos. 985918–985921 (ZJUH); 2♀♀, Shaanxi prov., Zhouzhi, Houzhenzi, 1300 m, 1998.VI.2–3, Ma Yun, Nos.981235–981236 (ZJUH); 1♀, Shaanxi prov., Foping, Longcaoping, 33.5°N, 107.9°E, 1998.VI.4, Ma Yun, No. 981985 (ZJUH); 4♀♀1♂, Shaanxi prov., Lantian, Tangyu, 34.1°N 109.3°E, 1998.VI.1, Ma Yun, Nos. 981217–981221 (ZJUH); 1♀, Shaanxi prov., Fengxian, Jialingjiang, 33.9°N, 106.5°E, 1998.VI.10, Sun Changhai, No. 985865 (ZJUH); 2♂♂, Shaanxi prov., Ningshan, Xunyangzhen, 33.3°N, 108.3°E, 1998.VI.6, Ma Yun, Nos. 982885–9828856 (ZJUH); 23♂♂, Shaanxi prov., Ningshan, Xunyangba, 2011.V.6, Chen Huayan, Nos. 201100192–201100214 (ZJUH).

Diagnosis. This new species belongs to the *himalensis* species group, and it runs to *A. himalensis* Mason in Bennett's key (2001), but differs in ♂ lateral of pronotum without longitudinal rugosity dorso-posteriorly (the latter with longitudinal rugosity); ♀ length of spine of scutellum 0.9 × length of propodeum, produced 50° dorsoposteriorly (the latter 0.6–0.7 × , more or less 35°); ♂ claspers in lateral view parallel dorsoventrally, 1.2 × its apical width (the latter slightly enlarged, 2.4 × its apical width); legs black (the latter at least partly pale yellowish-brown). It differentiates from other new species proposed in this study by the combination characters: ♀ frons without a longitudinal carina; mesoscutum and scutellum completely black, without pale spots; mesoscutum mostly pubescent; scutellum long triangle-shaped, tapered apically; length of scutellum 2.5 × its basal width; spine of scutellum produced 50° dorsoposteriorly; length of T1 4.1–4.2 × apical width; ♂scutellum more or less parallel in basal 0.25; spine of scutellum produced 50° dorsoposteriorly; length of T1 6.5 × its apical width; paramere 1.2 × its apical width.

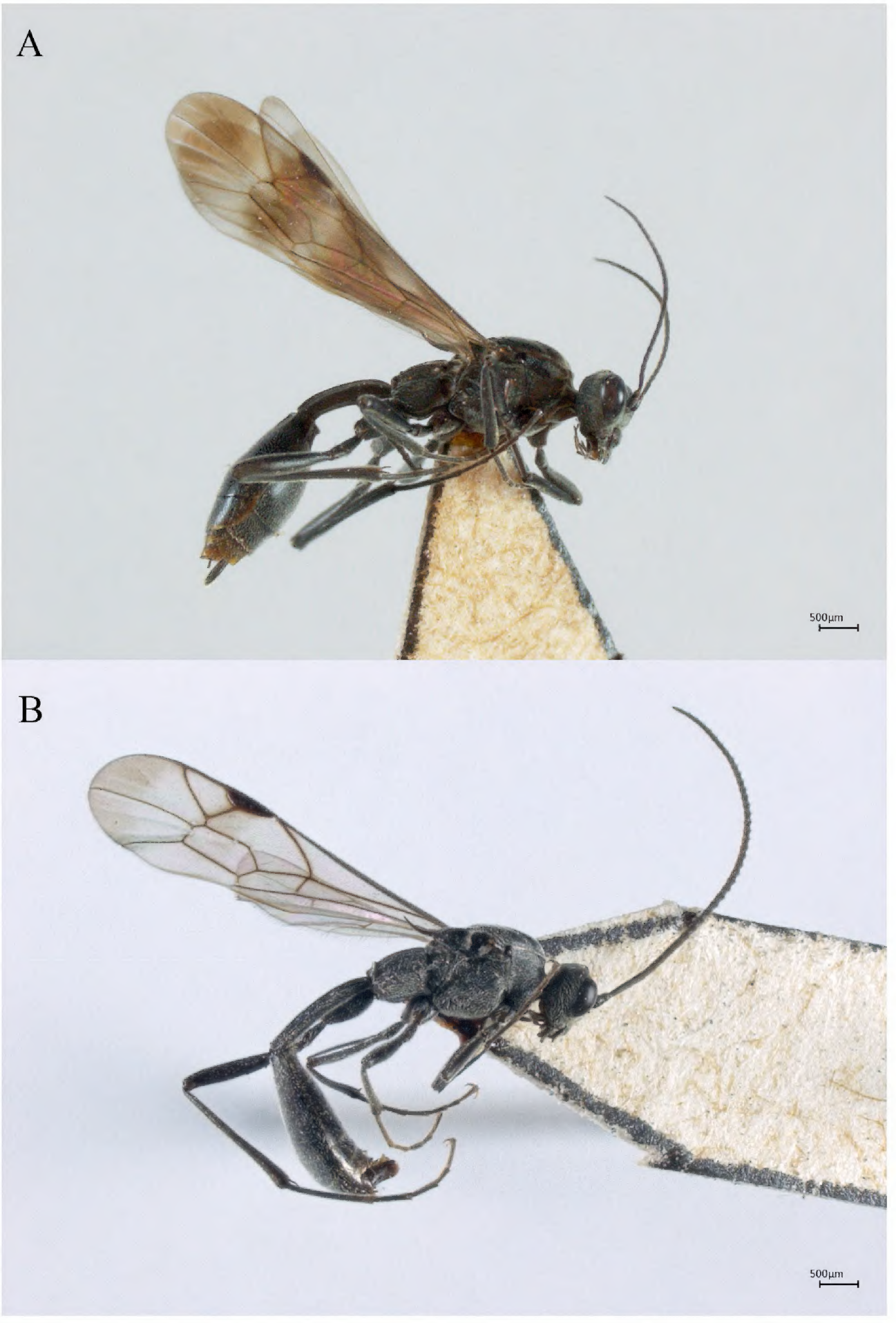

Figure 1. habitus, lateral aspect. **A** ♀, *Agriotypus dui* Tang, He & Chen, sp. nov. **B** ♂, *Agriotypus dui* Tang, He & Chen, sp. nov. Scale bar: 0.5 mm.

Description. Female. Body length 6.2 mm; fore wing length 5.0 mm.

Head. Head width 1.0 × its median length. Antennae 29-segmented, 0.6 × length of forewing. Temple behind eyes slightly roundly narrowed in dorsal view. Transverse diameter of eye 1.2 × temple in dorsal view. Frons convex medially, without longitu-

dinal carina. Antennal scrobe deep, with a weak carina on its lateral margin parallel to inner orbit of eye. Ocelli medium-sized, in triangle with base equal to its sides. POL: OD: OOL = 10: 12: 16. Face convex medially with coarse rugosity and dense pubescence. Area between antennal socket with a glabrous short longitudinal tubercle. Clypeus nearly pentagonal, 1.0 × its maximum width, roundly convex, flat and rugose with punctuation in basal half; thin apically, finely strigate, slightly rounded on apical margin; summit of covexity of clypeus smoothly rounded in lateral view. Distance between dorsal tentorial pits 2.5 × length between a tentorial pit and eye. Malar space equal to basal width of mandible. Occipital carina fine, but complete.

Mesosoma. Pronotum with long and strong epomia, portion dorsal to pronotal furrow curved sigmoidally; lateral of pronotum with more than 10 fine carinae dorsoposteriorly. Mesoscutum densely punctulate; notaulus distinct, meeting in apical 0.2. Scutellum long triangle-shaped, 2.5 × its basal width, 1.4 × length of propodeum; basal half of scutellum with lateral carinae and punctuation-rugosity, convex medially, tapering towards to apex, spine-like apical half, smooth; in lateral view scutellum roundly curved medially, distinctly up curved, apex slightly obliquely truncate, produced 50° dorsoposteriorly. Mesopleuron and metapleuron finely punctuate and pubescent; ecepicnemial carina strong, extending to ventral-anterior of mesopleuron; mesopleural sulcus complete; sternaulus strong. Propodeum finely coriaceous-punctate; lateromedian longitudinal carinae weakly convergent posteriorly; lateral longitudinal carinae straight, complete and paralleled with lateromedian longitudinal carinae.

Wings. Fore wing with vein 1cu-a just distad of M&RS, abscissa of vein M between 2rs-m and 2cu-m 1.5 × 2rs-m; hind wing with vein CU & cu-a intercepted by distal abscissa of CU at lower 0.15.

Metasoma. T1 4.1 × its apical width, 1.9 × length of propodeum; T1 finely punctulate-reticulate, spiracles situated in basal 0.3, lateral margin of T1 behind spiracles parallel; lateromedian carinae and dorsolateral carinae complete and strong, reaching to apex. T2 convex on basomedian area, with fainly carina before spiracle. T2 and following tergite densely punctulate. Ovipositor sheath 0.9 × length of hind basitarsus.

Colour. Black. Pronotum ventrally, tip of spine of scutellum, apical of metasomal tergite reddish brown. Fore wing with three fuscous longitudinal bands: basal band on basal 0.1–0.5 of forewing, but with a wide hyaline spot occupying middle of cell R; substigmal band below stigma and distal band in distal 0.25 of forewing; hind wing only apical margin slightly infuscate.

Variation. Body length 5.6–6.6 mm; fore wing length 4.8–5.2 mm. Head width 1.1 × its median length. Antennae 30-segmented. Scutellum 2.8 × its basal width; Fore wing with 1cu-a slightly distad of M&RS, abscissa of vein M between 2rs-m and 2cu-m 1.0–2.0 × 2rs-m; T1 3.6–3.9 × its apical width, 1.6 × length of propodeum. Body color dark reddish brown.

Male. Body length 6.2–6.8 mm; fore wing length 5.4–5.7 mm. Antennae 39–40-segmented. POL: OD: OOL = 13: 12: 20. Lateral of pronotum without longitudinal rugosity dorso-posteriorly. Scutellum long triangle-shaped, 1.15–1.2 × length of propodeum; lateral carinae in basal 0.25 of scutellum more or less parallel, in apical 0.75 lineally narrowed; basal 0.45–0.5 of scutellum convex medially, with punctuation-

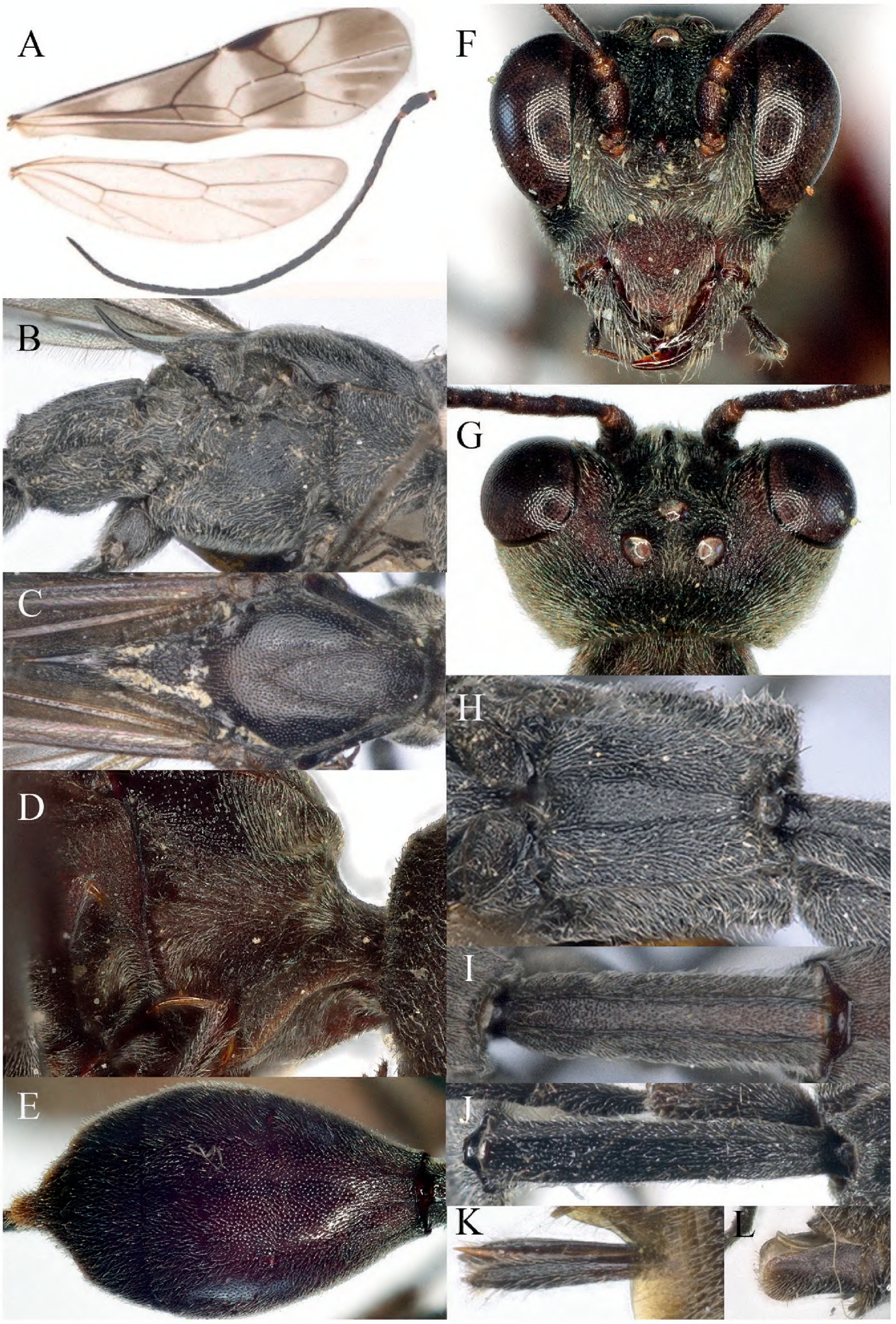

Figure 2. *Agriotypus dui* Tang, He & Chen, sp. nov. **A** ♀, antennae & wings **B** ♀, mesosoma, lateral aspect **C** ♀, mesosoma, dorsal aspect **D** ♀, lateral of pronotum **E** ♀, metasoma (except T1), dorsal aspect **F** ♀, head, front aspect **G** ♀, head, dorsal aspect **H** ♀, propodeum, dorsal aspect **I** ♀, T1, dorsal aspect **J** ♂, T1, dorsal aspect **K** ♀, ovipositor sheath, lateral aspect **L** ♂, paramere, lateral aspect.

rugosity; apical 0.5–0.55 of scutellum spine-like. lateromedian longitudinal carinae of propodeum more or less parallel, distinctly convergent in apical half. Fore wing with vein 1cu-a just distad of M&RS, abscissa of vein M between 2rs-m and 2cu-m slightly longer than 2rs-m; hind wing with CU & cu-a interrupted at lower 0.2. T1 6.5–6.8 × its apical width, 2.4–2.5 × length of propodeum; lateral margin of petiole more or less parallel. Paramere short, 1.2 × its apical width, apically bluntly round, more or less truncate. Fore wing faintly infuscate, only with more or less fuscous bands apically and below stigma. Otherwise similar to female.

Host. Unknown.

Distribution. China (Shaanxi).

Etymology. This species is named in honour of Dr Du Yuzhou, the collector of the type specimen.

***Agriotypus maae* sp. nov.**

http://zoobank.org/EC415191-DA10-4CB9-87ED-5487CA1C19F6

Figs 3A, 4

Material examined. ***Holotype.*** ♀, China, Shaanxi prov., Qinling, Tiantaishan, 34.2°N, 106.8°E, 2000 m, 1998.VI.8, Du Yuzhou, No. 983376 (ZJUH). ***Paratypes*:** 1♀, China, Shaanxi prov., Zhouzhi Houzhenzi, 1990.V.24, Du Yuzhou, No. 984474 (TARI); 1♀, China, Shaanxi prov., Zhouzhi Houzhenzi, 1990.V.24, Du Yuzhou, No. 984475 (ZJUH); 1♀, China, Shaanxi prov., Foping Longcaoping, 33.5°N, 107.9°E, 1998.VI.4, Ma Yun, No. 981986 (ZJUH).

Diagnosis. This new species belongs to the *himalensis* species group, and it runs to *A. maculiceps* Chao in Bennett's key (2001), but differs in frons with longitudinal carina (the latter without); pronotum finely punctate-rugose (the latter reticulate-rugose); scutellum entirely black (the latter pale in apical half), spine of scutellum produced more or less 85° dorsoposteriorly (the latter 35–45°). It differentiated from other new species proposed in this study by the combination characters: ♀ vertex near eyes and mesoscutum medio-posteriorly with large reddish brown patch; frons with a longitudinal carina; mesoscutum mostly glabrous; spine of scutellum produced 85° dorsoposteriorly.

Description. Female. Body length 7.4 mm; fore wing length 5.8 mm.

Head. Head width 0.8 × its median length. Antennae 23-segmented, 0.5 × length of forewing. Temple behind eyes distinct narrowed in dorsal view. Transverse diameter of eye 1.0 × temple in dorsal view. Frons convex medially, with longitudinal carina. Antennal scrobe more or less shallow. Ocelli in triangle with base equal to its sides. POL: OD: OOL = 12: 11: 24. Face convex medially with coarse rugosity and dense pubescence. The area between antennal socket with a glabrous circular tubercle. Clypeus nearly pentagonal, almost equal to its maximum width, roundly convex, flat and rugose with punctuation in basal 0.6; thin in apical 0.4, without distinct rugosity, bluntly rounded on apical margin; summit of covexity of clypeus smoothly rounded in lateral view. Distance between tentorial pits 1.3 × length between a dorsal tentorial pit and eye. Malar space 1.15 × basal width of mandible. Occipital carina fine, but complete.

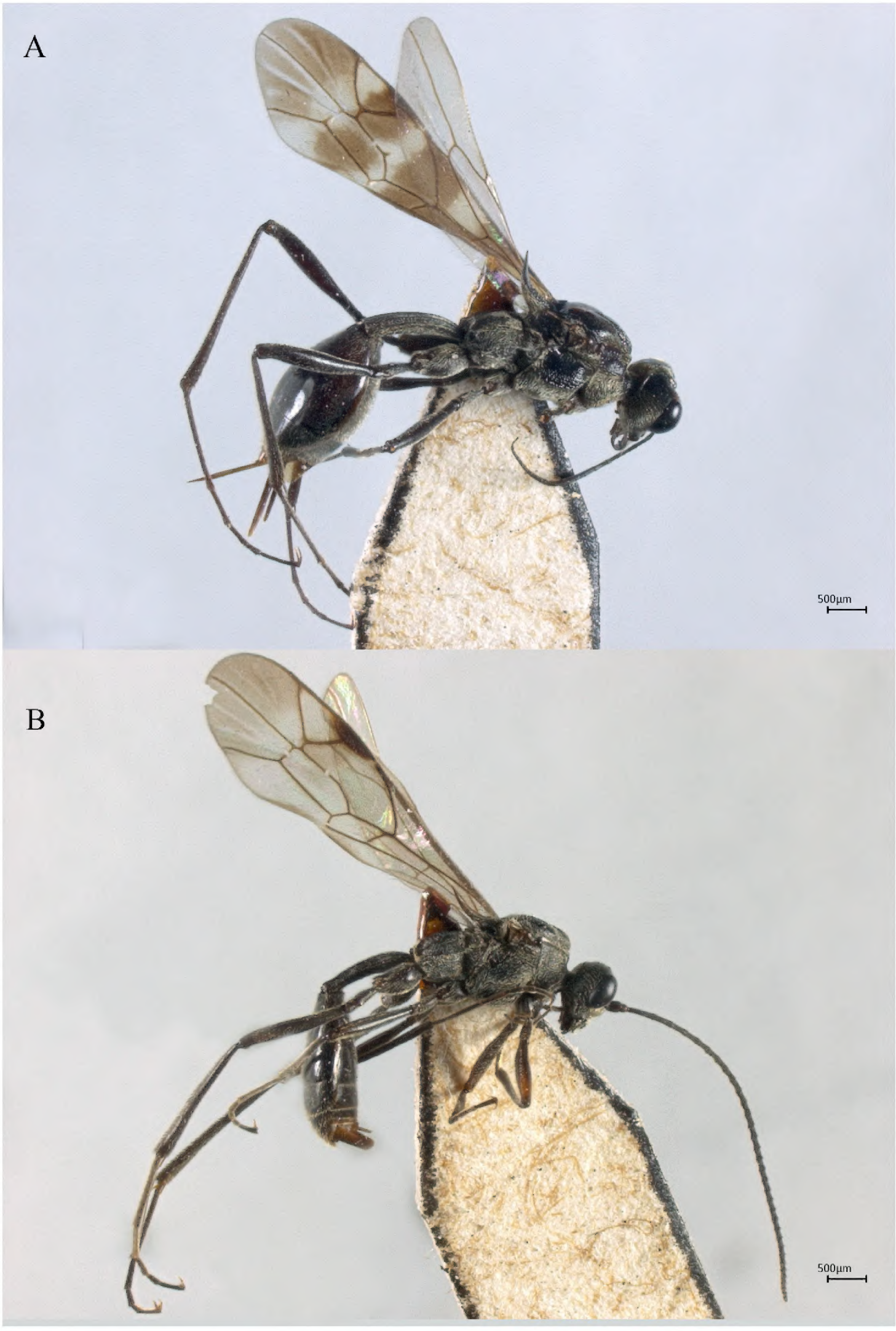

Figure 3. habitus, lateral aspect **A** *Agriotypus maae* Tang, He & Chen, sp. nov. **B** *Agriotypus morsei* Tang, He & Chen, sp. nov. Scale bar: 0.5 mm.

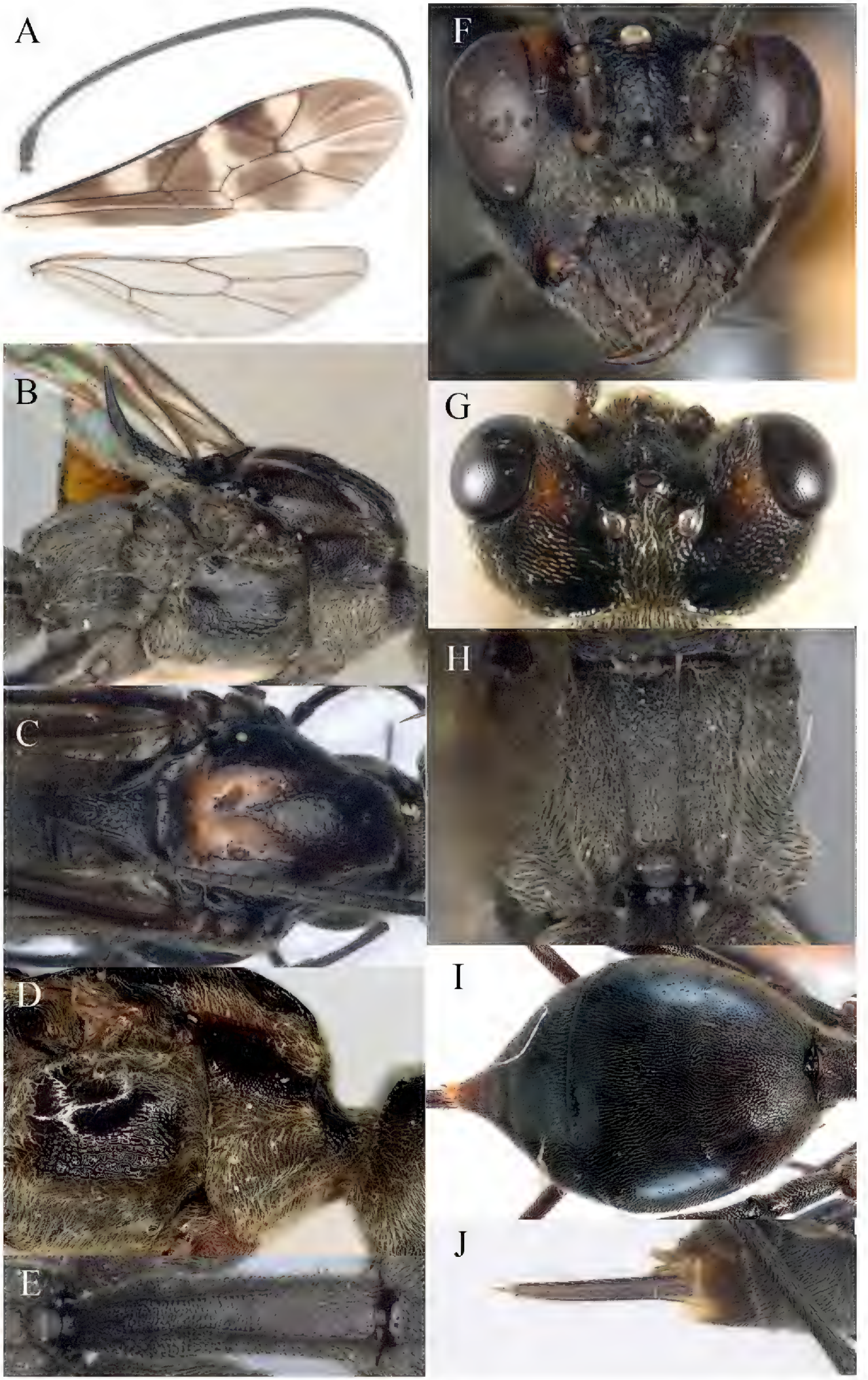

Figure 4. *Agriotypus maae* Tang, He & Chen, sp. nov. **A** antennae and wings **B** mesosoma, lateral aspect **C** mesosoma, dorsal aspect **D** lateral of pronotum **E** T1, dorsal aspect **F** head, front aspect **G** head, dorsal aspect **H** propodeum, dorsal aspect **I** metasoma (except T1), dorsal aspect **J** ovipositor sheath, lateral aspect.

Mesosoma. Pronotum with fine epomia, dorsally curved angulate posteriorly; lateral of pronotum glabrous, reticulate in dorsal half, dense pubescent in ventral half. Mesoscutum mostly glabrous, shiny, with fine punctulation and rugosity partly; median lobe medially and lateral lobe mostly smooth; notaulus narrow, more or less crenulated, meeting in apical 0.3. Scutellum long triangle-shaped, 2.5 × its basal width, 1.2 × length of propodeum; basal half of scutellum with lateral carinae and reticulation-rugosity, convex medially, lateral margin of scutellum paralleled in basal 2/3, tapering towards to apex, spine-like apical half, smooth; in lateral view scutellum roundly curved medially, spine-like in apical 0.4, distinctly up curved, apex tapered, produced 85° dorsoposteriorly; ecepicnemial carina strong, extending to ventral-anterior of mesopleuron; mesopleural sulcus complete; sternaulus strong. Propodeum punctate-reticulate; lateral longitudinal carinae straight and strong and paralleled with lateromedian longitudinal carinae.

Wings. Fore wing with vein 1cu-a distad of M&RS, abscissa of vein M between 2rs-m and 2m-cu 0.8 × 2rs-m; hind wing with vein CU & cu-a interrupted by distal abscissa of CU at lower 0.15.

Metasoma. T1 3.5 × its apical width, 1.5 × length of propodeum; T1 finely reticulate-punctate, spiracles situated in basal 0.3, lateral margin of petiole behind spiracles parallel; lateromedian carinae and dorsolateral carinae complete and strong, reaching to apex. T2 convex on basomedian area, with a pair of short carinae medially and a lateral carina before spiracle. T2 and following tergite densely punctulate. Ovipositor sheath 2.2 × length of hind basitarsus.

Colour. Black, vertex near eyes and mesoscutum medio-posteriorly with large reddish brown patch. Hypopygium yellowish brown apically. Leg black. Fore wing with three dark brown longitudinal bands: basal band on basal 0.1–0.5 of forewing, but with a wide hyaline fascia occupying middle of cell R; substigmal band below stigma and distal band in distal of forewing; hind wing nearly hyaline.

Variation. Body length 7.0–7.4 mm; fore wing length 5.6–5.8 mm. Antennae 25-segmented. Transverse diameter of eye 0.9 × temple in dorsal view. Scutellum 2.0 × its basal width, 1.4 × length of propodeum. T1 4.1 × its apical width, 2.2 × length of propodeum.

Male. Unknown.

Host. Unknown.

Distribution. China (Shaanxi).

Etymology. This species is named in honour of Mrs Ma Yun, who collected many materials of *Agriotypus* and provided a lot of help in our research work.

***Agriotypus morsei* sp. nov.**

http://zoobank.org/B29CE340-22F4-454D-82EE-098C67C526AE

Figs 3B, 5

Material examined. ***Holotype.*** ♂, China, Shaanxi prov., Qinling, Tiantaishan, 34.2°N, 106.8°E, 2000 m, 1998.VI.8, Ma Yun, No. 982948 (ZJUH).

Diagnosis. This new species belongs to the *himalensis* species group, and it runs to *A. tangi* Chao in Bennett's key (2001), but differs in body and spine of scutellum

black (the latter brown to reddish brown); spine of scutellum produced more or less 80° dorsoposteriorly (the latter 20°); T1 5.5 × its apical width (the latter at least 7.0 ×); paramere in lateral view parallel dorso-ventrally, 3.0 × its apical width (the latter enlarged apically, 1.8 × its apical width); T2 finely punctulate (the latter striate-rugose). It differentiates from other new species (*A. dui* sp. nov.) proposed in this study by the combination characters: ♂ scutellum tapering from base to tip (the latter more or less parallel in basal 0.25); spine of scutellum produced 80° dorsoposteriorly (the latter 50°); length of T1 4.8 × its apical width (the latter 6.5 ×); paramere 3.0 × its apical width (the latter 1.2 ×).

Description. Male. Body length 5.6 mm; fore wing length 5.2 mm.

Head. Head width 0.83 × its median length. Antennae 35-segmented, 1.2 × length of forewing. Temple behind eyes distinct narrowed in dorsal view. Transverse diameter of eye 1.2 × temple in dorsal view. Frons slightly convex medially, without longitudinal carina. Antennal scrobe more or less shallow, deeper near antennal socket, without a carina on its lateral margin parallel to inner orbit of eye. Ocelli in triangle with base equal to its sides. POL: OD: OOL = 12: 13: 20. Face convex medially with coarse rugosity and dense pubescence. Area between antennal socket with a glabrous short longitudinal tubercle. Clypeus nearly pentagonal, 0.75 × its maximum width, roundly convex, flat and rugose with punctuation in basal 0.6, thin in apical 0.4, without distinct rugosity, bluntly rounded on apical margin; summit of covexity of clypeus smoothly rounded in lateral view. Distance between dorsal tentorial pits 1.8 × length between a tentorial pit and eye. Malar space 1.8 × basal width of mandible. Occipital carina fine, but complete.

Mesosoma. Pronotum with strong epomia, dorsally curved angulate posteriorly. Mesoscutum densely punctulate; notaulus narrow, meeting in apical 0.1. Scutellum long triangle-shaped, 2.0 × its basal width, 1.1 × length of propodeum; basal half of scutellum with lateral carinae and punctuation-rugosity, convex medially, tapering towards to apex, spine-like apical half, smooth; in lateral view scutellum roundly curved medially, distinctly up curved, apex tapered, produced 80° dorsoposteriorly. Prepectal carina strong, extending to ventral-anterior of mesopleuron; mesopleural sulcus shallow, indistinct posteriorly, finely longitudinally rugose dorsally, mostly sparsely punctate posteriorly. Propodeum punctate-rugose; lateromedian longitudinal carinae distinctly convergent posteriorly; lateral longitudinal carinae more or less straight, complete and paralleled with lateromedian longitudinal carinae.

Wings. Fore wing with vein 1cu-a distad of M&RS, abscissa of vein M between 2rs-m and 2cu-m 0.8 × 2rs-m; hind wing with vein CU & cu-a intercepted by distal abscissa of CU interrupted at lower 0.3.

Metasoma. T1 5.5 × its apical width, 1.8 × length of propodeum; T1 punctulate-reticulate, spiracles situated in basal 0.3, lateral margin of T1 behind spiracles parallel; lateromedian carinae and dorsolateral carinae complete and strong, reaching to apex. T2 convex on basomedian area, with a pair of short carinae medially and a lateral carina before spiracle. T2 and following tergite fine and sparse punctulate, nearly smooth. Paramere in lateral view parallel dorso-ventrally, 3.0 × its apical width, apically roundly truncate.

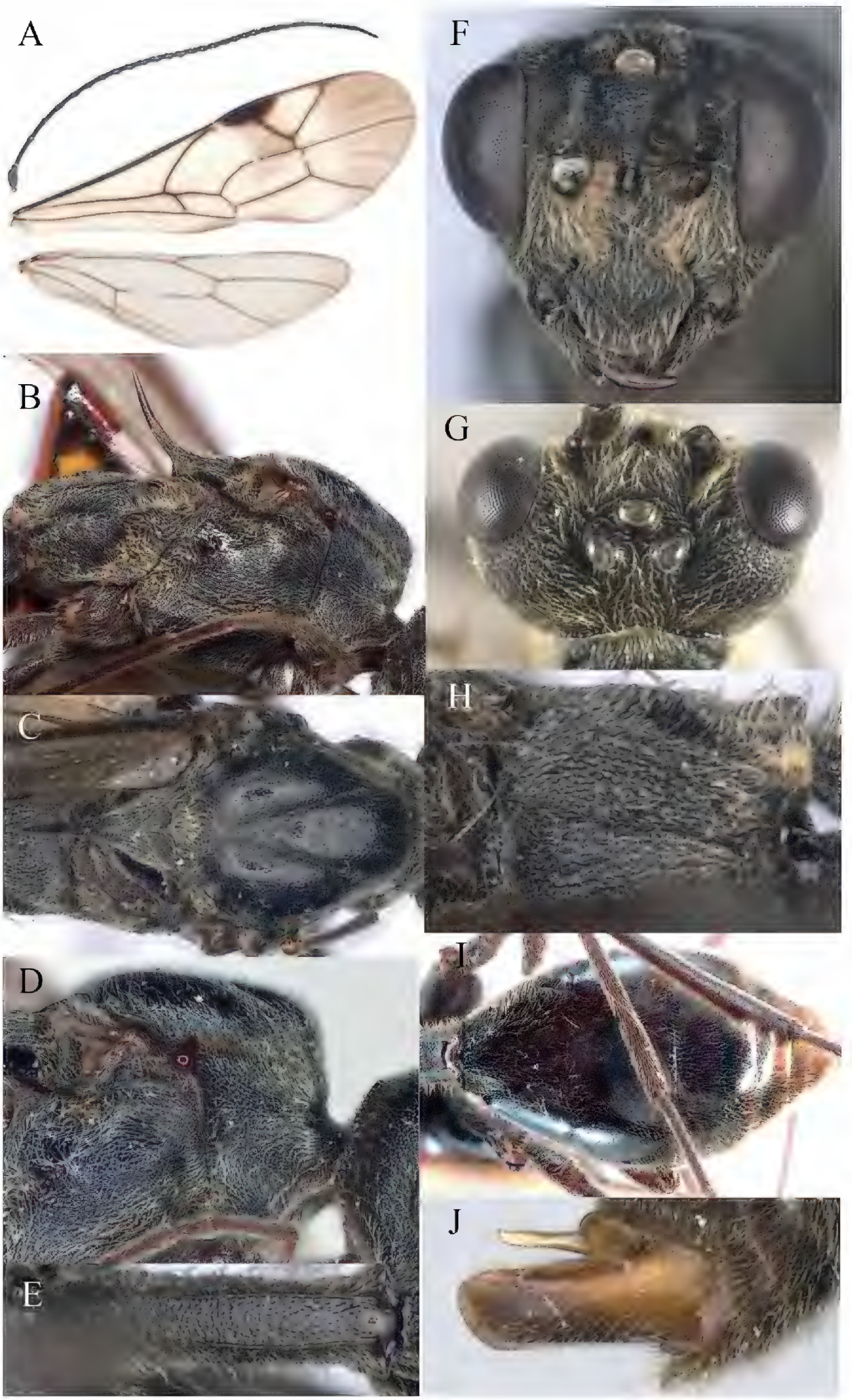

Figure 5. *Agriotypus morsei* Tang, He & Chen, sp. nov. **A** antennae and wings **B** mesosoma, lateral aspect **C** mesosoma, dorsal aspect **D** lateral of pronotum **E** T1, dorsal aspect **F** head, front aspect **G** head, dorsal aspect **H** propodeum, dorsal aspect **I** metasoma (except T1), dorsal aspect **J** paramere, lateral aspect.

Colour. Black. apical of metasomal tergite and paramere reddish brown. Fore wing with two faint fuscous longitudinal bands: substigmal band below stigma and distal band in distal 0.25 of forewing; hind wing only apical margin slightly infuscate.

Female. Unknown.

Host. Unknown.

Distribution. China (Shaanxi).

Etymology. This species is named in honour of Prof. J.C. Morse of Clemson University, USA, who sponsored the survey on aquatic insect in Shaanxi Qinling natural reserve in 1998.

***Agriotypus taishunensis* sp. nov.**

http://zoobank.org/797CD376-9CDB-424B-883A-AD62BD8C4977

Figs 6A, 7

Material examined. ***Holotype.*** ♀, China, Zhejiang prov., Taishun, Wuyanling, 34.2°N, 106.8°E, malasy trap, 2005.VIII.1–2, Wang Yiping, No. 200604963 (ZJUH).

Diagnosis. This new species belongs to the *himalensis* species group, and it runs to *A. lui* Chao in Bennett's key (2001), but differs in spine of scutellum slender, produced dorsal posteriorly (the latter spine of scutellum thicker, produced posteriorly); T1 5.5 × its apical width (the latter 2.6 ×); lateromedian longitudinal carinae of propodeum more or less parallel (the latter distinctly convergent apically). It differentiates *A. zhejiangensis* He & Chen from Zhejiang, China in body reddish brown (the latter black); spine of scutellum distinctly upcurved (the latter completely straight); forewing with fuscous longitudinal bands (the latter without); length of T1 5.5 × apical width (the latter 4.6′). It differentiates from other new species proposed in this study by the combination characters: ♀ body reddish brown, mesoscutum without pale spots posteriorly; frons with a longitudinal carina; distance between tentorial pits 3.8 × the length between a tentorial pit and eye; scutellum long triangle-shaped; spine of scutellum longer than length of propodeum, produced more or less 30° dorsoposteriorly, apex more or less truncate; T1 5.5 × its apical width.

Description. Female. Body length 7.3 mm; fore wing length 5.0 mm.

Head. Head width 0.9 × its median length. Antennae broken. Temple behind eyes linearly narrowed in dorsal view. Transverse diameter of eye 1.7 × temple in dorsal view. Frons convex medially, with a longitudinal carina. Antennal scrobe shallow. Ocelli medium-sized, in triangle with base equal to its sides. POL: OD: OOL = 11: 10: 12. Face convex medially with coarse rugosity and dense pubescence. Clypeus nearly pentagonal, 0.9 × its maximum width, roundly convex, thin in apical 0.4, almost truncate on apical margin; summit of covexity of clypeus smoothly rounded in lateral view. Distance between dorsal tentorial pits 3.8 × length between a tentorial pit and eye. Malar space equal to basal width of mandible. Occipital carina fine, but complete.

Figure 6. habitus, lateral aspect. **A** *Agriotypus taishunensis* Tang, He & Chen, sp. nov. **B** *Agriotypus yangae* Tang He & Chen, sp. nov. Scale bar: 0.5 mm.

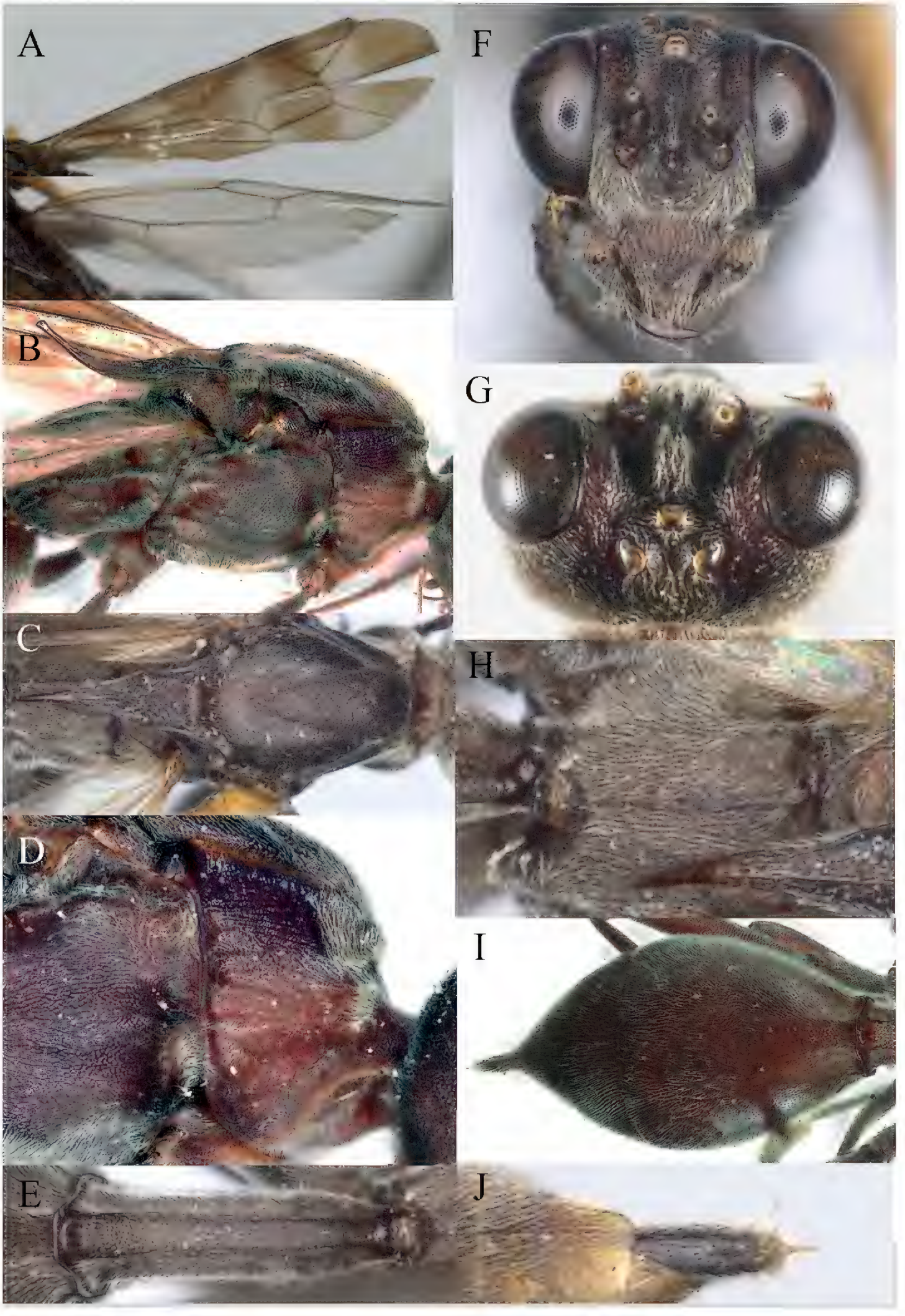

Figure 7. *Agriotypus taishunensis* Tang, He & Chen, sp. nov. **A** wings **B** mesosoma, lateral aspect **C** mesosoma, dorsal aspect **D** lateral of pronotum **E** T1, dorsal aspect **F** head, front aspect **G** head, dorsal aspect **H** propodeum, dorsal aspect **I** metasoma (except T1), dorsal aspect **J** ovipositor sheath, lateral aspect.

Mesosoma. Pronotum with strong epomia, dorsally curved angulate; lateral of pronotum with more than fine carinae dorso-posteriorly. Mesoscutum finely shiny, with dense punctures; notaulus distinct, meeting in apical 0.2. Scutellum long triangle-shaped, 2.8 × its basal width, 1.6 × length of propodeum; basal half of scutellum with lateral carinae and reticulation-rugosity, convex medially, lateral margin of scutellum paralleled in basal half, tapering towards to apex, spine-like apical half, smooth; in lateral view scutellum roundly curved medially, spine-like in apical half, distinctly up curved, apex tapered, produced 30° dorsoposteriorly; ecepicnemial carina strong, extending to ventral-anterior of mesopleuron; mesopleural sulcus complete; sternaulus strong. Propodeum finely coriaceous-punctate, lateromedian longitudinal carinae more or less parallel; lateral longitudinal carinae straight, complete and paralleled with lateromedian longitudinal carinae.

Wings. Fore wing with vein 1cu-a interstitial of M&RS, abscissa of vein M between 2rs-m and 2cu-m 1.25 × 2rs-m; hind wing with vein CU & cu-a intercepted by distal abscissa of CU interrupted at lower 0.2.

Metasoma. T1 5.5 × its apical width, 2.0 × length of propodeum; T1 corasely punctate, spiracles situated in basal 0.3, lateral margin of petiole behind spiracles parallel; lateromedian carinae and dorsolateral carinae complete and strong, reaching to apex. T2 convex on basomedian area, with a pair of short carinae medially and a lateral carina before spiracle. Ovipositor sheath 0.9 × length of hind basitarsus.

Colour. Reddish brown; metasoma apically and legs dark brown. Fore wing with three fuscous longitudinal bands: basal band on basal 0.1–0.5 of forewing, but with a wide hyaline fascia occupying middle of cell R; substigmal band below stigma and distal band in distal of forewing; hind wing nearly hyaline.

Host. Unknown.

Distribution. China (Zhejiang).

Etymology. Name derived from the name of location where the holotype was collected.

Agriotypus yangae sp. nov.

http://zoobank.org/26E0EC41-B89D-4FBB-A065-06D0D3237AAC

Figs 6B, 8

Material examined. ***Holotype.*** ♀, China, Shaanxi prov., Qinling, Tiantaishan, 34.2°N, 106.8°E, 1998.VI.9, Sun Changhai, No. 985922 (ZJUH).

Diagnosis. This new species belongs to the *himalensis* species group, and it runs to *A. chaoi* Bennett in Bennett's key (2001), but differs in ♀ scutellum funnel-shaped (the latter triangle-shaped); spine of scutellum black (the latter light brown apical half); mesoscutum punctate and pubescent (the latter sparsely pubescent and impunctate postero-medially). It differentiates from other new species proposed in this study by the combination characters: ♀ frons without a longitudinal carina; mesoscutum and scutellum completely black, without pale spots; mesoscutum pubescent; scutellum funnel-shaped; length of scutellum 1.8 × its basal width; spine of scutellum short, distinctly obliquely upward, rounded apically; T1 3.4 × its apical width.

Figure 8. *Agriotypus yangae* Tang, He & Chen, sp. nov. **A** antennae and wings **B** mesosoma, lateral aspect **C** lateral of pronotum **D** mesosoma, dorsal aspect **E** T1, dorsal aspect **F** head, front aspect **G** head, dorsal aspect **H** propodeum, dorsal aspect **I** metasoma (except T1), dorsal aspect **J** ovipositor sheath, lateral aspect.

Description. Female. Body length 7.2 mm; fore wing length 6.0 mm.

Head. Head width equal to its median length. Antennae 26-segmented, 0.7 × length of forewing. Temple behind eyes roundly narrowed in dorsal view. Transverse diameter of eye 1.2 × temple in dorsal view. Frons convex medially, with shallow depression near middle ocelli, without longitudinal carina. Antennal scrobe deep, with a weak carina on its lateral margin parallel to inner orbit of eye. Ocelli medium-sized, in triangle with base equal to its sides. POL: OD: OOL = 15: 13: 22. Face distinctly convex medially with coarse rugosity and dense pubescence. Area between antennal socket with a glabrous tubercle. Clypeus nearly pentagonal, equal to its maximum width, roundly convex, more or less flat medially and rugose with punctuation in basal half; thin apically, finely strigate, slightly rounded on apical margin; summit of covexity of clypeus smoothly rounded in lateral view. Distance between dorsal tentorial pits 1.7 × length between a tentorial pit and eye. Malar space 1.6 × basal width of mandible. Occipital carina complete.

Mesosoma. Pronotum with long and strong epomia, portion dorsal to pronotal furrow curved sigmoidally; lateral of pronotum with more than seven fine carinae dorsoposteriorly. Mesoscutum punctate-rugose; notaulus deep, meeting in apical 0.2. Scutellum funnel-shaped, 1.8 × its basal width, 1.1 × length of propodeum; basal half of scutellum with lateral carinae and punctuation-rugosity, convex medially, lateral margin of scutellum paralleled in basal 2/3, tapering towards to apex in apical 1/3; in lateral view scutellum less roundly curved medially, distinctly obliquely upward, apex more or less rounded, produced 10° dorsoposteriorly. Mesopleuron and metapleuron finely punctuate and pubescent; ecepicnemial carina strong, only extending to ventral-anterior of mesopleuron; mesopleural sulcus complete; sternaulus strong. Propodeum punctate-rugose; lateromedian longitudinal carinae weakly convergent posteriorly; lateral longitudinal carinae straight, complete and paralleled with lateromedian longitudinal carinae.

Wings. Fore wing with vein 1cu-a distad of M&RS, abscissa of vein M between 2rs-m and 2cu-m 1.25 × 2rs-m; hind wing with vein CU & cu-a intercepted by distal abscissa of CU interrupted at lower 0.15.

Metasoma. T1 3.4 × its apical width, 1.65 × length of propodeum; T1 finely irregularly rugose-striate, transverse rugose before spiracles, spiracles situated in basal 0.3, widest at level of spiracles; lateromedian carinae and dorsolateral carinae complete and strong, reaching to apex. T2 with a pair of short carinae medially and a lateral carina before spiracle; T2 densely finely strigose. T3 and following tergite densely punctulate. Ovipositor sheath 0.8 × length of hind basitarsus.

Colour. Black. Apical of four tergites, sternites and ovipositor reddish brown. Leg black. Fore wing faintly infuscate, with three slightly fuscous longitudinal bands: basal band near cu-a; substigmal band below stigma and distal band in distal 0.25 of forewing; hind wing more or less hyaline.

Male. Unknown.

Host. Unknown.

Distribution. China (Shaanxi).

Etymology. This species is named in honour of Dr Yang Lianfang, the famous entomologist who studied the taxonomy of Trichoptera in China.

Discussion

Agriotypus is a fascinating and small genus, with 16 species recongnized from a small number of specimens. Five new species of *Agriotypus* were identified in this study. All of them could be found in East Aisa, with only one exception *A. armatus*, which is extensively distributed in Europe. It would be more accurate to state East Asia is thought to be the *Agriotypus* species diversity hotspot rather than Southeast Asia as Bennett (2001) mentioned.

The Palaearctic *armatus* species group and the Oriental *himalensis* species group are the two conventional species groupings for this genus. All the five new species were assigned to the *himalensis* species group because of having T2 with dorsal and dorsolateral longitudinal carinae basally, epomia dorsally curved sigmoidally or angulate. *A. taishunensis* sp. nov. is found in Taishun, Zhejiang province, in the Oriental region, while the other four, *A. dui* sp. nov., *A. maae* sp. nov., *A. morsei* sp. nov., and *A. yangae* sp. nov., were all collected from Mt. Qinling, Shaanxi province, in the transitional zone between the Oriental and the Palaearctic regions, which corresponds to the geographical ranges of the *himalensis* species group. This is also the first time this genus has been discoverd in the Northwest China.

All the Asian species of this genus have narrow geographical ranges, and several species are sympatry (Chao, 1992; Bennett, 2001), while four new species have been obtained from Qinling. In this study, we proposed five new species, in which three species are only known from single specimen, but these three new species are delimitated mainly based on color pattern, sculptures, T1 length and width ratio, scutellum shape, angle of scutellum spine, all of which are commonly used for the species identification of this family or this genus. To fully undertand this unique genus, more research, including molecular analysis, will be required in the future.

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